EXHIBIT W

5 Choosing the Appropriate Control Group in Merger Evaluation

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5.1 Introduction

Since airline deregulation occurred in the 1970s there has been substantial policy and academic interest in the effects of competition in the industry. One avenue studied by researchers is the effect of past mergers. Evaluating previous mergers can inform whether past antitrust enforcement was applied correctly and also allow better informed prospective merger enforcement. Despite the large amount of data available in the airline industry and the frequency of merger and acquisition activity, determining the price effects of past mergers can be difficult. In this paper we provide one example. Using the Delta-Northwest merger of 2008 we show, using a standard differences-in-differences regression analysis, that how control routes are selected can affect substantially the implied inferences.

The merger between Delta and Northwest occurred in 2008. On April 14, 2008 Delta Air Lines Inc. and Northwest Airline Corporation announced plans to merge in a transaction that would create the largest airline in the world. After a six-month investigation, the Department of Justice determined that the proposed merger likely would produce substantial and credible efficiencies to the benefit of consumers and that it would not

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substantially lessen competition.[1] Throughout 2009 the merged firm undertook various steps to combine their operations including combining their ground operations, reservation systems, terminals and gates at various airports around the country, and reward programs.

Several research papers have examined the effects of airline mergers. These retrospectives typically have compared prices on "treated" routes where there was a loss of competition with prices on "control" routes where there was no loss of competition (i.e. routes where only one of the two merging firms operated or where neither firm operated). Sometimes the control routes used in the comparison group are selected such that the distance between endpoints is similar to that of the affected routes. In this paper we show that these modeling choices can affect inferences. In particular, we show that important differences can exist between the control and treated groups that are not captured fully by the covariates. Carefully limiting the control routes to be more similar to the routes affected by the merger can change the results substantially.

We first evaluate the price effect of the Delta-Northwest merger on connecting routes using a standard differences-in-differences approach and find that the price effect from the merger is positive and significant. This price effect is driven, in part, by the facts that (i) the control routes are on average much less traveled than the treated routes, and (ii) the prices on less traveled routes tend to decrease over the sample period relative to highly traveled routes. We show that accounting for this one factor alone can significantly change the results, calling into question the results based on the standard differences-in-differences approach. We then use a matching estimator that pairs each treated route with a single control route selected based on the number of passengers, and we find that the price effect is small, on the order of one percent for the largest routes.

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[1] Press release:
http://www.justice.gov/atr/public/press_releases/2008/238849.htm

Of course, route size is one of several characteristics for which it may be important to control. We finish by discussing how the promising methodology of Abadie and Gardeazabal (2003) and Abadie, Diamond and Hainmueller (2010) could be applied to optimally select among control routes.

5.2 The Challenge for Retrospectives

Despite the interest in merger retrospectives, in many industries implementation can be problematic. It can be difficult to get data appropriate for the analysis. Further, simply examining the prices for the firms directly involved in the merger before and after the merger occurred can be misleading if price changes due to demand and cost shocks occurring at this time are attributed to the merger. A common way to deal with this problem is to compare the changes in product prices of the merging firms with changes in the price of products of other firms or in other markets, a differences-and-differences approach. If the comparison group's prices evolve in the same way they would have if the merger had not occurred and similar to how the treated groups' prices would have evolved, this difference-in-difference approach can yield consistent estimates of the impact of the merger on prices. The crucial identifying assumption in this approach to obtain impact estimates is that the counterfactual trend is the same for treated and control observations.

Our work focuses specifically on this identifying assumption. In particular, we explore how the selection of the comparison group can affect the results of differences-in-differences analysis. We select the Delta-Northwest merger for two reasons: First, the airline industry features thousands of routes that were unaffected by the merger and that could be used to measure how prices likely would have evolved on affected routes but for the merger. The routes unaffected by the merger can control for changes such as changes in fuel costs, in labor costs, seasonal variations in demand, and overall inflation that

influence airfares. Second, that the merger was contemporaneous with the onset of a recession, and an overall drop in demand for travel, highlights the importance of having an appropriate comparison group in the differences-in-differences analysis.

Our work is relevant to a burgeoning literature that uses comparison groups and the differences-in-differences methodology to identify the effects of mergers. One prominent example is Ashenfelter and Hosken (2010), which studies five consummated mergers in consumer products industries: cereal, liquor, motor oil, feminine protection and breakfast syrup using scanner data. To evaluate the effects of these mergers, the authors compare the change in price of the products of the firms involved in the merger with the change in price of the private label products. The logic for using private label products is that they are likely to be distant substitutes and therefore not affected significantly by the merger but at the same time serve as a valid control for changes in the cost of production since many of the inputs are the same.[2] The authors find that 4 of the 5 mergers led to modest price increases.

Similar analysis has been conducted in the airline industry. For example, Severin Borenstein (1990) studied the effect of two mergers that took place in 1986: Northwest and Republic airlines and TWA and Ozark airlines. Borenstein found that the average fare on Northwest and Republic routes out of Minneapolis/St. Paul, which was a Northwest and Republic hub, increased relative to the industry average on routes of similar distance, suggesting that the merger led to significant price increases. He found little evidence of

[2] The authors note that there are some drawbacks to using this as a control group. Mainly there might be demand shocks for the products of interest that do not affect the private label products, such as income. The closest substitutes are likely affected by the same demand shocks, although comparing to this control group will lead to an underestimate of the price effect because these closest substitutes will also experience a price increase if the merger is anticompetitive.

price increases from the TWA and Ozark airlines merger. Kim and Singal (1993) examined 14 airline mergers from 1985 to 1998. They estimate the price effect of the mergers by comparing the change in fares on routes serviced by merging firms with the change in fares on routes of a similar distance in which none of the merging parties operated. They find that on average fares increased by 9.44%.

We build on this literature by more fully exploring how the selection of the comparison group can affect inferences. In particular when evaluating the merger of Delta and Northwest there are specific events that occurred at the time of the merger, which make the choice of a control group of particular importance. The merger was announced in early 2008 and approved in October 2008. In 2009 the airline industry faced declining demand and decreased revenues due the recession, high unemployment rates and decreases in corporate travel budgets. The recession hit different communities to differing degrees. For example, some states such as Florida and California were hit much harder by the recession relative to states such as Massachusetts. Also, companies in certain industries were better able to control their travel budget in response to changes in market conditions relative to other industries and since some industries are geographically focused this may lead to differing demand changes by route. While it is possible to partially control for these factors with variables such as local GDP figures and local unemployment rates, it is difficult to capture all aspects of these demand shocks that may affect travel.

Another big change in the airline industry in this time period was the introduction of baggage fees and the increase in ancillary fees (e.g. extra legroom seats) by many of the large U.S. carriers. Prior to 2008, airlines allowed passengers to check two bags free of charge. In February 2008, United Airlines announced that it would begin charging $25 for the second checked bag effective for travel beginning on May 5, 2008. Throughout the year other legacy carriers and AirTran followed by announcing a fee for a second checked

bag.[3] On May 21, 2008 American announced that it would begin charging a $15 fee for the first checked bag effective June 5, 2008 and by the end of 2008 all of the carriers had followed.[4] These changes, if unaccounted for, could lead to incorrect inferences. For example, on a route where a legacy carrier competed with a carrier who charged fewer ancillary fees, absent any market structure changes, the carrier may have to decrease its ticket prices more than it would in a market where it competed with another carrier charging similar fees. If the merger disproportionately affected routes of the first type then the merger may look like it had less of a price effect than it actually did.

5.3 Data

The data source used in this study is common to that used in much of the empirical literature in this field: Passenger Origin-Destination Survey of the U.S. Department of Transportation (DB1B), which consists of a 10% sample of all airline tickets available at a quarterly level. We use data from 2006-2011 for this study and exclude several quarters of data around the time of the merger (Quarter 2 of 2008 through Quarter 1 of 2009). We only include airport-pairs within the contiguous U.S. and fares that are above $25.[5] The data are aggregated to the market-level within each quarter using passenger

[3] The other legacy carriers followed by announcing a fee for a second checked bag on April 9, 2008. Unlike other low cost carriers, AirTran also announced a fee of $10 for a second checked bag on April 11, 2008. Shortly after this carriers began to charge fees for the first checked bag.

[4] By mid-September all the legacy carriers except for Delta had adopted this fee for the first checked bag. Delta followed in November of 2008.

[5] The inbound and outbound parts of a roundtrip are treated as separate one-way observations, each with a fare of one-half of the roundtrip price. In doing this we make each one-way trip as non-directional. We drop open-jaw tickets.

weights. We also merge on Official Airline Guide (OAG) schedule data which allows us to better identify non-stop flights (rather than direct flights) and the competitive structure on a route; this is preferable to using the DB1B data because it excludes carriers only offering code share service. Additionally, we include population and unemployment data for the endpoint locations of the route using yearly Census data. Using this data we are able to obtain domestic airfares, number of passengers by route, route distance, concentration measures by route and demographic data to capture some demand shocks. However, it is important to note that as discussed above, the data does not record any ancillary fees paid by passengers. This source of revenue for airlines is becoming more prevalent and significant.

This data are well-suited to this exercise for several reasons. They are available over a long time period, allowing us to include two years prior and after the merger. We are able to omit the period right around the merger which allows us to abstract from deciding when the merging firms started coordinating on price. The post-merger data also provides a long enough window after the merger to allow for the capture of any marginal cost efficiencies which take a while to be realized and passed through to consumers. The data also have information on a large number of routes, which allows for a large set of routes that can potentially be included in the control group

5.4 Connect Routes

The analysis in this paper focuses on one-stop connecting routes affected by the Delta/Northwest merger. The focus in the literature has generally been nonstop routes. Typically, connecting routes can easily be served though the hubs of most major airlines and therefore these markets tend to be less concentrated. However, in recent years there has been an increased consolidation of the airline industry, which has led to a decline in the number of independent carriers.

This means that there are fewer carriers that can operate in connect routes and discipline existing carriers, increasing the likelihood of anticompetitive effects. The Delta/Northwest merger provides an opportunity to consider whether a merger of two large carriers would lead to a price increase on these connecting routes. As described in Table 1 there were a large number of one-stop connect routes affected by the merger and a significant number of passengers who could be potentially harmed.

Table 1 Routes Affected by Delta-Northwest Merger

Type of Routes	Estimated Number Affected by Merger	Estimated Number of Passengers	Volume of Commerce
Nonstop	8	1.25 Million	$214 Million
Connecting Routes	4,222	36 Million	$8 Billion

In the full year before the merger, the second quarter of 2007 through the first quarter of 2008, Delta and Northwest competed on 4,222 one- stop connecting routes. There were over 35 million passengers on these routes and the total volume of commerce on these connect routes was over $8 billion. Even a small price effect would lead to large consumer harm.

On some routes with connecting traffic there is also nonstop service. The existence of this nonstop service may constrain a price increase by connecting carriers because when the gap between nonstop and connect fares becomes large enough some passengers will switch to carriers providing nonstop service. To abstract from the issue of competition between non-stop and connect routes we only include routes with no nonstop service.

There are 7,320 connect routes included in our sample. Over half of these routes were served by both Delta and Northwest prior to

their merger. We have 16 quarters of data for each route after excluding the year around the time of the merger. The sample includes data on about 17 million passengers, which is a 10% sample of the passengers that flew these routes in this time period. Table 2 provides some summary information about the sample.

Table 2 Summary Statistics on Routes included in the Sample

	All Routes	Affected by the Merger	Unaffected by the Merger
Average Fare	$257	$248	$270
Average Number of Miles	1,058	1,101	1,000
Average Number of Competitors	2.9	3.7	1.9
Average Number of LCCs	0.2	0.3	0.1
Average HHI	6,038	4,867	7,635
Average Endpoint Unemployment Rate	7.8%	7.9%	7.7%
Average Endpoint Population	1,637,874	1,657,204	1,611,531
Number of Routes	7,320	4,222	3,098
Number of Passengers	16,822,929	13,660,845	3,162,078

As can be seen in Table 2 and discussed more fully below, there are several striking differences between the routes with a pre-merger overlap and those routes where Delta and Northwest did not compete with each other prior to the merger. Routes where Delta and Northwest competed tended to be larger in terms of the number of passengers; the overlap routes have more than three times the number of passengers on average. In addition, the routes affected by the merger tend to be significantly more competitive, having more legacy and LCC competitors and a lower HHI. However, these two sets of routes do not differ appreciably in terms of distance between

the final endpoints and demographic characteristics at the endpoint cities.[6]

It should also be noted that the routes with no overlap prior to the merger did not see a significant change in the number of competitors and HHI between the pre-merger and post-merger periods. In contrast, on routes where Delta and Northwest competed prior to the merger the average number of competitors decreased from 4.1 in the pre-merger period to 3.2 in the post-merger period, suggesting that many of these routes did not experience entry by other carriers in response to the merger.

5.5 Standard Differences-in-Differences

We start with a conditional mean analysis. In particular, we compare the average price change on routes where there was a loss of competition to the average price change where Delta and Northwest did not compete with each other prior to the merger.

We compare the actual price change on affected routes two years prior to the merger to the two years after the merger with the average price change on the unaffected routes controlling for distance on the route.[7] We exclude Q2-Q4 of 2008 and Q1 2009 data

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[6] While the two sets of routes do not vary greatly in terms of the average population of the two endpoint airport, they do vary significantly based on the population of the smaller of the two endpoints. For routes where there was no overlap pre-merger, the average minimum population of the two endpoint cities was 305,825. The average minimum population of the two endpoint cities for routes where there was overlap pre-merger was 546,512. The results below do not change when we include the population of the smaller endpoint rather than the average population of the two endpoints.

[7] More specifically, using the set of routes that were unaffected by the merger we regress price on the crow-flies distance and year dummies. The average price change is route specific and is based on the number of miles.

from our analysis because this was the period when the merger was announced, antitrust review was taking place and the parties were still entering their initial phases of integration. Using the full sample, this method suggests that the price increase on the affected routes was about 2 percentage points.

While this analysis can account for changes that occurred across routes from the pre-merger to post-merger periods it does not take into account route specific changes over this period. For example, some endpoint destinations may have been hit harder by the recession than others. If Delta-Northwest hubs in particular were harder hit by the recession this simple analysis may underestimate the price effects of the merger, i.e. without the merger, the price would have decreased by even more relative to the control, which includes routes that were not as hard hit by the recession.

One step towards controlling for some of these factors is to move into a regression framework. This allows us to easily control for certain characteristics such as a number of local economic conditions, distance, and population; in other words, we can control for characteristics that differ by route and may affect the post-merger price relative to the pre-merger price.

To estimate the price effect of the merger on connecting routes we estimate two specifications. The first includes a dummy variable to indicate whether Delta and Northwest competed on the route prior to the merger interacted with a dummy variable to indicate whether the observation is in the post-merger period. The coefficient on interaction term represents the effect of the merger on connecting routes. The regression estimated is:

$$ln(Price)_{qm} = a + b*overlap\_pre_m*post_q + c*avg\_pop_{qm} + d*avg\_unemp_{qm} + r + t$$

The second specification incorporates that the effect of the merger could depend on the degree to which the merger affects concentration on the route. The regression estimated is:

$$ln(Price)_{qm} = a + b*simHHI_m*post_q + c*avg\_pop_{qm} + d*avg\_unemp_{qm} + r + t$$

where $ln(Price)_{qm}$ is the average price in market m in quarter q; $simHHI_m$ is the change in HHI from the Delta/Northwest merger; $post_q$ is a dummy variable that indicates whether the q is in the window after the merger was consummated; avg_pop_{qm} is the average population between the two endpoint cities; avg_unemp_{qm} is the average unemployment in market m in quarter q; r is a set of route fixed effects, and t is a set of quarter fixed effects.[8] The results are presented in Table 3.

Table 3 Differences-in-Differences Analysis on Average Route Price

Variables	Specification 1	Specification 2	Specification 3	Specification 4
Merger Effect	0.04* (0.004)		0.04* (0.005)	
Simulated HHI		0.20* (0.02)		0.19* (0.01)
Average Population			$-3.09*10^{-6}$* $(5.79*10^{-7})$	$-3.01*10^{-6}$* $(7.03*10^{-7})$
Average Unemployment			-5. 21* (1.29)	-5.82* (0.69)
Observations	111,792			

An observation is a route-quarter. This regression is limited to one-stop connecting routes where there was no nonstop service and routes where Delta and Northwest operated for the full window prior to the merger. There are 7,320 routes included in the analysis. The dependent variable is the natural log of the average carrier ticket price. Both specifications include route and time fixed effects. Standard errors are shown in parenthesis and account for heteroscedasticity. Statistical significance at the 5% level is denoted by *.

[8] We tried using other variables to control for local economic conditions such as local GDP; the results are similar. Additionally, we tried specifications with the minimum and maximum of these variables and again the results did not change significantly.

The results indicate that the merger had a significant positive effect on prices. In the first specification, where the variable that captures the effect of the merger is a dummy variable that indicates whether Delta and Northwest competed on the route pre-merger, the price effect of the merger is about 4% on connecting routes. In the second specification that takes into account the change in HHI on the affected routes due to the merger the results suggest that an increase in HHI of 1000 points led to a 2% price increase. The average change in HHI on routes that were affected by the Delta/Northwest merger was about 430. The average price increase is small but given the large volume of commerce on connecting routes that were affected by the merger these results may raise concerns that the merger led to a not inconsequential amount of consumer harm. In fact, applying these estimates to the estimated volume of commerce suggests that there was about $70 million of harm.

Given that merger retrospectives are often conducted to understand the effect of past mergers on different types of routes, we conduct one further analysis to separate the effects by type of route. This can be more informative than the average price effect we found above. In particular, we focus on the price effect on routes by the size of the route. Harm on large routes will lead to a greater amount of consumer harm and may therefore be of particular interest. For this analysis, we include four interaction terms in the regression instead of one variable to capture the price effect. Based on frequency in the data we create four dummy variables to indicate whether the route had less than 2,000 passengers annually, 2,001-4,000 passengers annually, 4,001-10,000 passengers annually, and more than 10,000 passengers annually. We then interact each of these dummy variables with a variable that indicates if this was a route affected by the merger and if the observation is in the post-merger period. The results are shown in Table 4. Each coefficient represents the price effect of the merger on routes in the corresponding category.

Table 4 Affect of Merger by Route Size

Merger Effect Variables for:	Coefficient
Routes with < 2,000 Passengers	0.03* (0.006)
Routes with 2,001-4,000 Passengers	0.03* (0.006)
Routes with 4,001-10,000 Passengers	0.04* (0.006)
Routes with more than 10,000 Passengers	0.06* (0.005)
Average Population	$-3.269*10^{-6}$* $(1.38*10^{-7})$
Average Unemployment	-6. 05* (1.31)
Observations	111,792

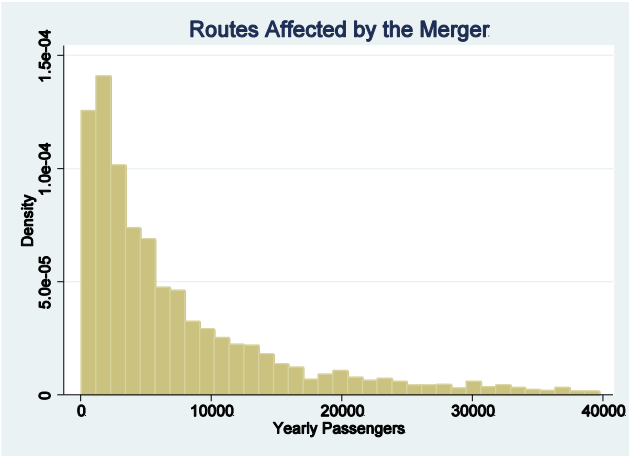
As can be seen in Table 4, the merger seemed to have the largest effect on routes with the largest number of passengers. On these routes, the average price effect is 6%, double the price effect on the smallest routes where the price affect was about 3%.

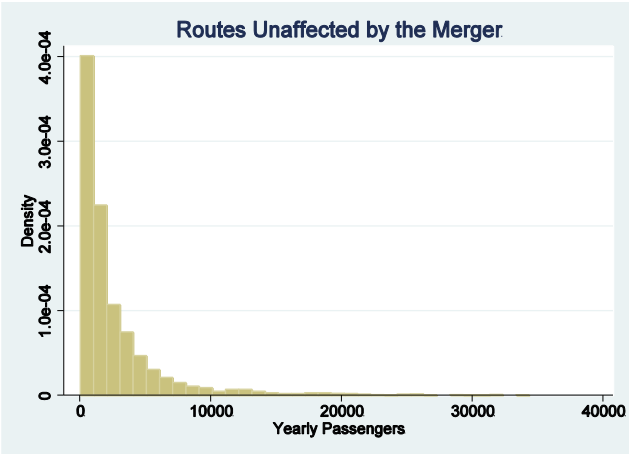
5.6 Importance of the Control Group

In determining whether the control group is appropriate, it is instructive to compare the control group and the treated group on observable characteristics pre-merger. One striking feature found when comparing the connecting routes where Delta and Northwest competed with those where they did not compete pre-merger is the difference in the level of passenger traffic. The average yearly number of passengers on routes affected by the merger is about 8,000 but is only about 2,800 on routes that are part of the control group.

The disparity in passenger volume between these two sets of routes is even starker when you look at the distribution as in Graph 1.

Graph 1 **Distribution of Passengers on Affected and Unaffected Routes**





Given this striking fact it is important to consider whether the results would change significantly if the control group was chosen to be a similar size to the treated group. Table 4 provides some initial

evidence that the size of the route had some effect on the change in price from the pre-merger period to the post-merger period. To further explore this, in Table 4 we present the raw price change from the two years after the Delta/Northwest merger to the two years prior to the merger.

Table 5 Median Price Change from before the Merger to after by Route Size

	Affected by the Merger		Unaffected by the Merger	
Size of Route (Yearly Passengers)	**% Change Price**	**# of Routes**	**% Change Price**	**# of Routes**
0-2,000	-1.0%	1,094	-4.8%	2,026
2,000-4,000	-1.0%	1,155	-2.3%	690
4,001-10,000	-0.5%	878	-0.0%	244
10,001+	+1.7%	1,095	+1.1%	138
All	**0.0%**	**4,222**	**-3.2%**	**3,098**

As can be seen in Table 5, the change in price from pre- to post-merger is dependent on the size of the route; for both routes affected by the merger and those unaffected by the merger the smaller routes tend to have experienced a larger price decrease over this time period. For unaffected routes the smaller routes experienced a fairly large price decrease, of about 5%. Routes with over 10,000 passengers experienced a small price increase of about 1%. There are various explanations for this. One possible explanation may be that routes with lower volume of traffic involve endpoints that were hit harder by the recession. Alternatively, there might be more discretionary traffic on smaller volume routes; if for example there is a higher portion of leisure travel on these smaller routes, at the time of the recession these travelers may become more price sensitive. Regardless of the reason, the pattern is clear. It is also possible to see

that estimating the effect of the merger using the full control group can affect the results. For example, the largest overlap routes affected by the merger (those with more than 10,000 passengers per year) experienced about a 2% price increase. This is not much larger than the price change experienced by the unaffected routes of the same size. However, if you compare this price change of 2% with the average of the unaffected routes (mainly compromised of small routes so average price change is -3.2%) it would seem that the large routes experienced a significantly large price increase, explaining the results in Table 4.

To see this more clearly we can look at a regression only using the routes affected by the merger with more than 10,000 passengers. We estimate the model described above with two different control groups: all the unaffected routes and unaffected routes of a similar size in terms of passenger traffic. The results are presented in Table 6.

Table 6 Regression Results with Different Set of Control Routes

	Route Size: More than 10,000 Passengers			
Variables	**Control Group: All**		**Control Group: in Same Size Group**	
Overlap	0.064* (0.003)		-0.002 (0.011)	
Simulated HHI		0.555* (0.045)		0.069 (0.080)
Observations	67,088		19,728	

An observation is a route-quarter. This regression is limited to one-stop connecting routes where there was no nonstop service and routes where Delta and Northwest operated for the full window prior to the merger. The dependent variable is the natural log of the average carrier ticket price. Both specifications include mean population and unemployment rates and route and time fixed effects. Standard errors are shown in parenthesis and account for heteroscedasticity. Statistical significance at the 5% level is denoted by *.

The results show that changing the control group can significantly change the results. For the affected routes with at least 10,000 passengers in the year before the merger, using all available control routes suggests that the Delta/Northwest merger led to a 6% price increase. Once we limit the control routes to those routes unaffected by the merger but with at least 10,000 passengers per year, the merger had a small and statistically insignificant effect. This difference can be important and could substantially change conclusions regarding whether the merger was pro-competitive or anti-competitive.

5.7 Alternative Methodology

However, it should be noted that this second set of results may be due to the small number of routes in the control routes. To better estimate the effect of the merger while choosing routes in the control group similar to the treated group we present results using a methodology where we design a control group of routes based on the number of passengers pre-merger. For each treated route, a route where Delta and Northwest competed with each other pre-merger, we find a route from those not affected by the merger that is most similar in terms of yearly passengers. One route can be the closest match for multiple treated routes; in these cases the route is given more weight in the regression. The results are presented in Table 7.

Table 7 Differences-in-Differences Analysis with Best Match Control Group

	Coefficient	
Overlap	0.01* (0.004)	
Simulated HHI		0.113* (0.009)
Observations	128,672	

An observation is a route-quarter. This regression is limited to one-stop connecting routes where there was no nonstop service and routes where Delta and Northwest operated for the full window prior to the merger. There are 8,042 routes included in the estimation. One route in the control route can be a best-match for multiple treated routes. The dependent variable is the natural log of the average carrier ticket price. Both specifications include mean population and unemployment rates and route and time fixed effects. Standard errors are shown in parenthesis and account for heteroscedasticity. Statistical significance at the 5% level is denoted by *.

As can be seen in Table 7 the affects of the merger substantially lessen. Using this methodology we find that instead of the 4% price effect we found using a simple differences-and-differences approach we find a 1% effect, small but statistically significant. The only change in this analysis relative to the previous results is that the sample used for estimation uses a control group that is more representative of the treated group of routes.

5.8 Discussion

Our objective has been to establish, using the Delta-Northwest merger of 2008 as an example, how the selection of the control group can affect inferences in merger retrospective analysis. To illustrate the point, we have compared regression results obtained by using *all* unaffected connect routes as controls to regression results obtained by using only a *single* unaffected connect route for each affected connect route, selected solely based on route size. We do not claim that either regression captures necessarily the average effect of the merger on the prices of connect routes. Indeed, we suspect that exercise would require more in-depth analysis. In this section, we discuss how one might construct the appropriate control groups for the analysis.

First, matching estimators such as the one we employ can incorporate control routes that are selected on the basis of multiple characteristics. Thus, one could identify control routes that resemble the affected routes not only in terms of size but also in terms of other characteristics that might matter for pricing, such as endpoint demographics and route distance. An advantage of matching estimators is that some of the characteristics can be endogenous outcomes (e.g., price or sales) provided that matching takes into consideration only data prior to the merger. This potentially allows one to effectively select as controls those routes that have similar *unobserved* exogenous characteristics.

Second, in some cases matching regressions can be sensitive to the number of controls that are selected for each affected group. In our work, we have selected one control route per affected route. This has the advantage of basing inference off the "most similar" unaffected route but is has the drawback that any idiosyncrasies that arise on these control routes can affect inferences. An alternative is to select two, three, five, or even more controls for each affected route, which reduces the influence of any single control route. In the limit, of course, this approach includes all available controls.

Given that inferences can vary based on this choice (as we show), how should one think about determining the appropriate number of control routes? The recent research of Abadie and Gardeazabal (2003) and Adabie, Diamond and Hainmueller (2010) provides one promising answer: one can incorporate all available control routes but weight each according to its similarity to the affected route. More specifically, the research proposes that "synthetic" routes could be constructed as weighted-averages of all the available control routes, where the weights are selection such that the synthetic route resembles to the greatest extent possible the affected routes. Regression analysis could then compare outcomes on the affected route to outcomes on the synthetic route, before and after the merger. We suspect this approach provides a robust path forward that could be useful for merger retrospectives in industries, such as airlines, where many possible controls are available and a challenge for inference is how to most appropriately utilize the information from those controls.

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